QUOTATIONS

THE NEW BRITISH PATENTS ACT

THIS act, the Patents and Designs Act, became operative on August 28. Its principal clause runs as follows: "At any time, not less than one year after the passing of this act, any person may apply to the Comptroller for the revocation of the patent, on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside of the United Kingdom." In future, foreign manufacturers, if they wish their patents to remain valid in Great Britain, will have to make the goods they sell within the United Kingdom. Otherwise their patents may be copied or infringed at will. Germany and the United States are particularly hit by the new enactment, and they are meeting the altered conditions by (1) building factories of their own in England; (2) acquiring premises already built for the purpose of carrying on their business; (3) arranging with British manufacturers to lay down plant and cooperate in the production of the special articles which are the subject of the patent. Already some thirty foreign firms—many of them conducting operations on a large scale—have begun, or are about to begin operations in this country, most of them choosing the north of England as the scene of their operations. It is said that as a rule the foreign manufacturer is providing a factory many times larger than is really necessary for the construction of his patented article, his explanation being that he can not run works in England on patents alone, and he intends therefore to manufacture in this country goods that have hitherto been imported ready-made. So far as can be seen at present the act must profit British labor. It is said in some quarters that these manufactures, at any rate the German ones, will be worked by foreign staffs, but this is not the case at present with Messrs. Meister, Lucius and Brünning (Limited), of Germany, a company with a capital of £11,000,000, which has just erected a new chemical factory at Ellesmere Port. Here all the workers employed are English, with the exception of a few German overseers. The working of the act will be watched with keen and anxious attention, for British manufacturers are beginning to realize that foreign competition is about to invade their own particular territory, and that there will be a fair but strenuous fight on British soil for British custom. That is not a prospect that can be viewed altogether without anxiety when the perfection of German organization is remembered. The German things to be manufactured in England will be mostly aniline dyes, pottery, plants for gas making, rifles, plated goods, electrical contrivances, furnaces, sanitary appliances; the American, typewriters, safety razors, phonograph records, shoes, telephones and wire roofing.—*Journal of the Society of Arts.*

SCIENTIFIC BOOKS

The Physiology of the Stomata. By FRANCIS ERNEST LLOYD. Pp. 1–142; f. 40, pl. 14. Carnegie Institution of Washington, Publication, No. 82.

The purpose of this study has been twofold: first, to determine to what extent the stomata are able to regulate transpiration; secondly, to ascertain the physiological cause of stomatal movement. The investigation was carried on almost exclusively with two desert plants, *Fouquieria splendens* and *Verbena ciliata*. Both of these plants were found to have leaves of the usual tropophytic character and without any of the obvious adaptive characters related to desert conditions. The rate of transpiration was determined by reading the volume of water absorbed from burettes to which cuttings of the plants were attached. By weighing any error due to the absorption of water by the tissues of the shoot or its loss by wilting was corrected. To determine the area of the stomatal openings at various times of day and so to correlate the movements of the guard-cells with the fluctuations of transpiration, portions of the epidermis were removed and fixed in absolute alcohol. It was found that this treatment had no appreciable effect upon the guard-cells and

consequently the exact area of the stomatal openings could be determined at any moment desired. The experiments revealed no correlation between the daily periodicity of transpiration and stomatal movement. On the other hand, it was first of all found that the rate of transpiration increased for a considerable time after the maximum stomatal opening in the early morning and that finally the rate may undergo sudden and wide changes without the accompaniment of a sufficient change in the dimensions of the stomata to account for them on the theory of stomatal regulation of transpiration. This latter result is in accord with the conclusions of Brown and Escombe who have found that the diffusion capacity of the stomata are quite generally greatly in excess of the actual maximum rate observed.

The experiments conducted under constant conditions demonstrated that transpiration is a physiological process, and not a physical one and that it is not to be looked upon as a necessary evil with which the plant has to contend. The rhythm of transpiration under constant conditions could not be correlated with stomatal movements and indeed it was later found in the case of wilting leaves that the beginning of the closure of the stomata occurs somewhat later than the initial wilting of the leaf and this movement appears rather as a result of the loss of water by the leaf as a whole than as a response in anticipation of wilting. The results of all the experiments indicate that the stomata are not adaptive structures in the active sense and if a regulation of transpiration exists it is effected by other means.

A valuable portion of the study is to be found in the second part of the work, dealing with the physiology of the guard-cells. By comparisons of the contents of the guard-cells taken at periods corresponding to the stomatal movements observed in connection with the work on transpiration, the writer found that these movements are correlated with marked changes in the nature of the cell contents. Thus it was found that starch begins to accumulate in the guard-cells in the afternoon, the maximum amount being observed in the night, while during the earlier hours of the morning the starch largely disappears, globules of oil, frequently one in each guard cell, taking its place. The movements and periods of stacis of the stomata were closely correlated with these fluctuations of the starch contents and it is inferred that the disappearance of the starch and the openings of the stomata are connected with the action of some unknown ferment. This conclusion necessitated the hypothesis that the metabolism of the guard-cells is radically different from that of the mesophyll cells and evidence was found to warrant this conclusion. The guard-cells were seen to accumulate starch at a time when it was disappearing from the ordinary chlorenchyma and on the other hand they were quite free of starch when photosynthesis was most active. This difference in function was further emphasized by experiments in which the leaves were exposed to the blue end of the spectrum, to darkness and to air devoid of carbon dioxide—under all of these conditions the plastids of the guard cells continued to accumulate starch though photosynthesis was impossible. It is maintained that the starch occurring in the guard cells is derived from the carbohydrates in the mesophyll and that the function of the chlorophyll in the guard-cells is in part, probably largely, secretory. It becomes necessary in accepting this hypothesis on the rôle of the guard-cells to assume that the ferment operative in the transformation of starch is of a radically different nature from other amylases since it is absent or inactive during the night and because of its marked activity during the earlier morning hours.

In conclusion the author finds no evidence in the behavior of the stomata studied to justify the conclusion that they in any way adapt these plants to the unfavorable conditions of the desert. He holds that the prevalence and magnitude of the devices that characterize xerophytes does not indicate that these plants have become fitted to their environment, but being fitted, they have survived. It must be conceded, however, that practically

identical xerophytic characters occur under a wide range of external conditions that are physiologically equivalent.

CARLTON C. CURTIS

The Principles of Direct-current Electrical Engineering. By JAMES R. BARR, A.M.I.E.E., Lecturer in Electrical Engineering, Heriot-Watt College, Edinburgh. New York, The Macmillan Company; London, Whittaker & Co. 1908. Pp. viii + 551; 294 illustrations.

There are several ways in which the general subject of electrical engineering may be divided for study or treatment in text-books. One very general scheme is first to take up the study of direct-current phenomena as applied to direct-current machinery, then to consider the study of alternating currents and alternating-current machinery, and finally to study the subject of transmission and distribution of power by both direct and alternating currents. A second method of division is to consider direct currents as a special case of periodic currents and to make the general division of the study of generators and receivers between induction apparatus and synchronous machines. Here again the subject of transmission and distribution is treated after a study of the machinery of both classes. A third classification consists of dividing the general subject into direct-current engineering and alternating-current engineering, treating under each head the generators, receivers, and systems of distribution utilizing direct currents or alternating currents as the case may be. For those who prefer the third classification the author has prepared a volume on the first division which should find a considerable application in colleges and technical schools.

The general method of treatment is not different from that used by other authors who prefer to consider direct-current engineering as separate from alternating-current phenomena. The first chapter is devoted to a review of the subject of units used, the relation of all practical units to the fundamental units being carefully stated. This is followed by chapters dealing with the laws of the electric circuit and the magnetic circuit, but before the application of these laws to the direct-current generator is taken up in detail a carefully written chapter on measuring instruments, in which the principle of operation and the sources of error of most of the instruments in common use are considered, is introduced, and this is followed by a brief study of the storage battery, electric lighting and cables. Three chapters are devoted to the direct-current generator, and in these three chapters the author has placed in a logical manner most of the information desired by those not interested directly in the details of designing. The subjects of motors and boosters are similarly treated and the book is completed by chapters on testing and electricity control, the final chapter setting forth the general principles involved in the design of the switchboard and of protective apparatus.

From the beginning the book deals primarily with the principles involved, the details of apparatus being introduced as illustrations of the manner in which the principles are applied rather than for the purpose of furnishing a catalogue of apparatus. To further aid the student in making application of general principles to calculations, carefully prepared problems with their complete solutions are introduced at intervals throughout the text, and similar problems for solution by the students themselves are stated in an appendix. The problems as given are practical and the illustrations of machinery and instruments are taken from modern practise. The use of two colors in the diagrams of armature windings and other connections should aid the student greatly in his study of the subject. The index of the book is complete enough to make it a ready work of reference.

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
June 26, 1908

SCIENTIFIC JOURNALS AND ARTICLES

The Journal of Experimental Zoology, Vol. V., No. 4 (June, 1908), contains the following papers: